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AUTHOR	Fischer, Richard B.
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ABSTRACT

This document, written for teachers, outlines the causes and extent of environmental problems relating to air pollution, water pollution, the use of fertilizers and pesticides, land use, and population density. A short bibliography includes references to periodicals and books dealing with teaching methods as well as references for background reading. (EB)

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POLLUTION

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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AN ENVIRONMENTAL CRISIS

SE 008 421

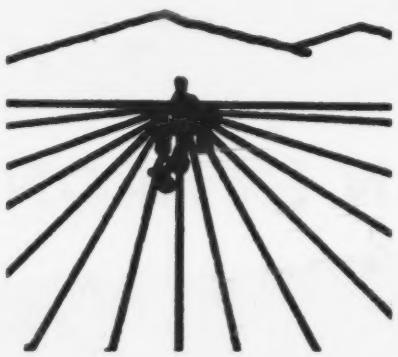
Conservation Day 1970 / The University of the State of New York - The State Education Department

To Superintendents And Principals

Friday, April 24, 1970, has been proclaimed Conservation Day by Ewald B. Nyquist, Commissioner of Education.

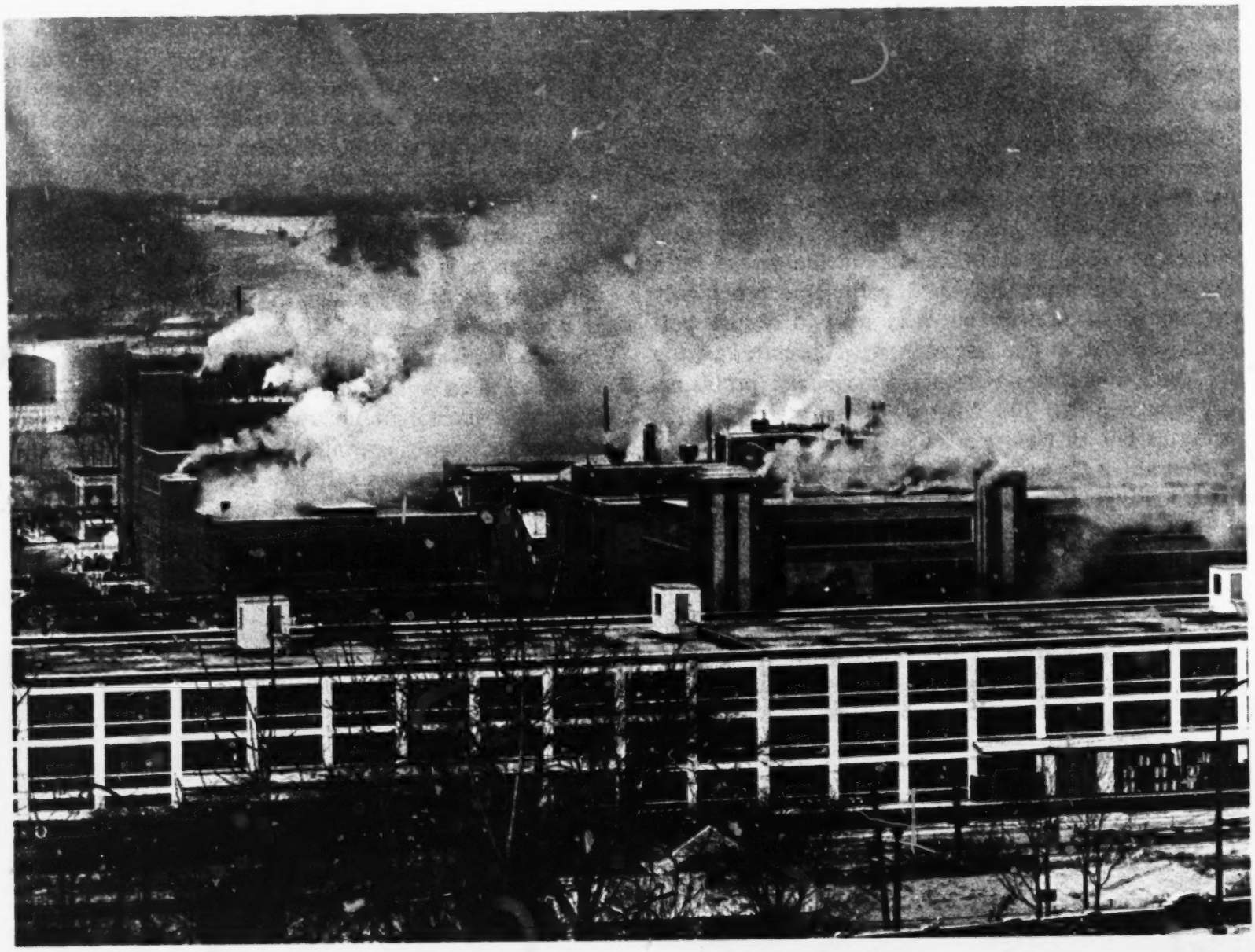
The theme for Conservation Day this year centers upon man, who in ever-increasing numbers has abused his natural environment to the extent that he is now in danger of being engulfed in his own pollution. Now is the time for positive action by all Americans to reverse this deadly cycle of waste and destruction which threatens our natural environment. Young people are especially encouraged to actively plan and participate in year-round conservation projects designed to meet specific local needs. Hopefully, these examples of the concerns of youth in terms of concrete action will inspire others, at all levels of leadership, to move ahead in seeking solutions to the problem of providing ecological balance so future generations may be surrounded by clean air and water, productive soil, and natural beauty.

The original material for this publication was written by Richard B. Fischer, Professor, Nature and Conservation Education, of Cornell University. Photographs were supplied through the courtesy of *Keep America Beautiful,* the New York State Conservation Department, and Professor Fischer. Peter A. Martin, of the Bureau of Elementary Curriculum Development, coordinated the project and prepared the materials for publication.



P B Langworthy

PHILIP B. LANGWORTHY
Associate Commissioner for Instructional Services



Environmental Crisis

We Americans have always been proud of our industrial progress and high standards of living. Only recently have we become aware of the high price of this progress. It is a price paid in dollars, deterioration, and death. Conservationists everywhere — in universities, research institutions and at the highest level of State and National Government — have issued a somber warning: MAN IS ON A COLLISION COURSE WITH NATURE! Man, who has unravelled the complex workings of living things in their natural environments and called his knowledge the science of ecology. Man, who knows that he is bound by the same ecological laws that govern other life. Man, who behaves as though he were some special creature for whom all else was created.

What, then, is the state of our environment? And what can we do to avert the catastrophe conservationists fear? Let us first examine the pollution of air, water, soil, and scenery. Then we will look at the basic, underlying problem of population.

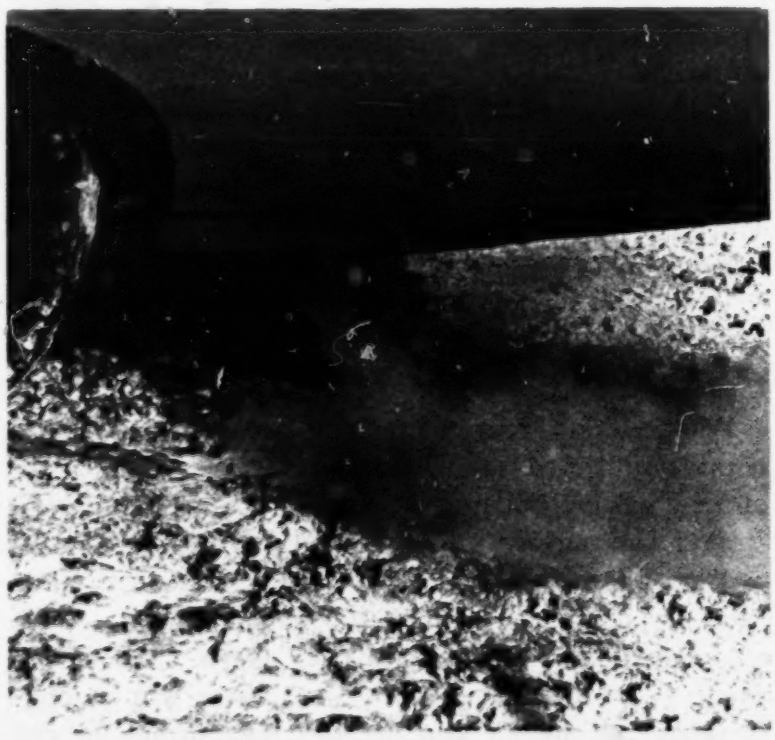
The Air We Breathe

Air pollution, one of the most noxious of products of industrial civilization, is a threat not only to plant and animal life but to man himself. An average New Yorker can survive on 4½ pounds of water each day and on 4 pounds of food. In order to stay alive, however, he needs to breathe 30 pounds of air. This amounts to approximately 16,000 quarts. No matter where you live in New York State, there will be contaminants in the air you breathe. According to our

State Health Department, no community of 2,500 or more is free from air pollution. Furthermore, cities and suburbs pollute the air around them so that people hundreds of miles away are affected.

Pollutants in the form of smoke and fumes are easy to see. Usually they contain extremely small particles that result from poor combustion of fuels. Sometimes there are fine ashes produced by factory furnaces that burn large amounts of fuel and send the smoke up a chimney. Unfortunately, these particles are not only irritating in themselves, but they tend to absorb pollutant gases from the atmosphere, concentrating the gases and thus causing further atmospheric problems. It is estimated that 203,520 tons of dirt and poisonous chemicals fall on New York City every year!

What about the air pollutants you cannot see? Every fire, whether it is in your home, your car, or in a factory, could produce a variety of highly poisonous gases. One of them may be sulfur dioxide. It attacks nearby plant life, irritates our respiratory tissues, and even reacts with water to form acids that attack metal surfaces. Another dangerous gas, carbon monoxide, reacts with the hemoglobin in the blood so that oxygen cannot be carried to our tissues. Automobiles in New York State — 6,000,000 now and increasing every year — produce 90 percent of the total amount of this dangerous chemical. We can be encouraged that our State Legislature has enacted laws requiring modifications of automobile engines to reduce this health hazard.



So far we have hinted at the harmful effects of air pollution, but what are the facts? Dirty air costs each person in New York State $65 a year! This money is spent on painting houses and office buildings, washing cars, laundering and dry cleaning clothes because they get dirty sooner, replacing metal doors and window screens, using more electric lighting, and spending more for medical care and medicines. In terms of our health, air pollution is even more alarming. The number of persons dying of lung ailments is doubling every 5 years. If a person is between 50 and 70 years of age, the chances of his dying of lung diseases are twice as great if he lives in an area of high air pollution. In New York City, for instance, the pollutants one breathes each day amount to what you would inhale if you smoked two packages of cigarettes. It is a fact that the incidence of lung cancer is higher among New York State residents who live in the cities. This is one price we pay for polluting our environment.

The Water We Drink

When that legendary English seaman sailed up to Albany on the river that now bears his name, fish and other aquatic life thrived in the clear pure waters. Now, 361 years later, fishing has all but disappeared from the Hudson and it is unsafe to drink the water from this or from any other river in New York State without first testing it. What has happened to this priceless resource?

When Europeans first settled New York and other parts of eastern North America, they threw their household sewage animal wastes into roadside ditches, much as some of the undeveloped peoples in the world still do today. As populations increased, people found it better to put pipes into the ground, connect all the sinks and toilets to the pipes, and run the water into the nearest river where it would be carried downstream. There was no thought of the effect on aquatic life, or of the dangers to persons downstream who might use the water for drinking purposes. As our population and industrialization increased, and we produced more and more human and industrial wastes, our rivers, lakes, and streams became contaminated to an unbelievable degree. Lake Erie, one of the largest fresh water lakes in the world, is now essentially a biological desert, a desert created by man's thoughtlessness.

What happens to a river when it becomes polluted? Organic wastes (those coming from humans or animals)

cause a shortage of oxygen in the water. This, in turn, soon causes the death of fish and other water life. As the dead creatures decay, they produce annoying odors and disgusting sights. Animals that come to drink this water can themselves become sick and die. Humans who drink or swim in such contaminated water may contract a number of diseases including hepatitis, diphtheria, dysentery, typhoid fever, and others.

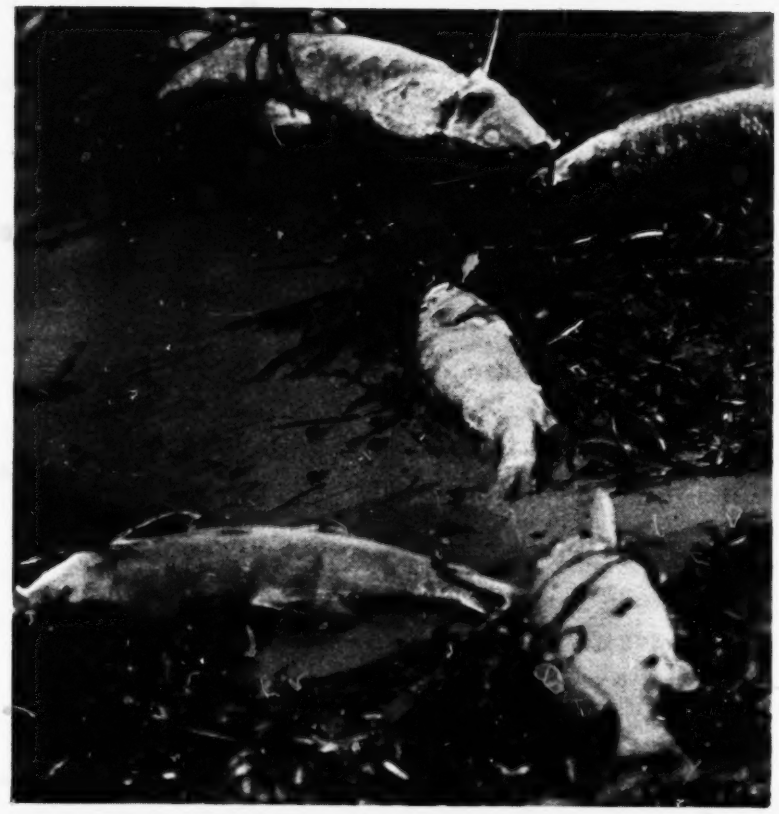
If you live along a waterway that has been so badly polluted that it is unsafe for swimming, boating, or fishing, you know about the harmful effects on recreation and property values. Our New York waters are also important to a variety of industrial processes. Rochester, famous the world over for film manufacturing, owes its location to the high quality of the water.

It is a surprise to many persons to learn that this planet has no more water now than it did when it was first formed. New York's water resource is essentially the amount of precipitation that falls on it each year, an average of about 40 inches. The average New Yorker uses more than 150 gallons of water each day, which is more than eight times what he used 70 years ago.

It is estimated that by 1980 the State's population will require three times what it is now using for domestic purposes. Even so, domestic consumption accounts for only about 8 percent of all the water we use in the State; industry and agriculture are actually the largest consumers. By 1980, their demands are expected to increase also. Clearly, our standard of living depends upon an abundant supply of clean water. Since the amount of water available to New York State was fixed more than two billion years ago, we shall have to use the same water over and over again. We must, therefore, do everything in our power to keep it clean.

The Soil We Plant

Human and animal wastes are not the only contaminants in water. Portions of nearly every chemical we put on our soil may eventually find their way into our rivers, streams, lakes, and eventually the ocean. This means, then, that portions of a fertilizer applied to an upstate cornfield will find its way into the ground water system and eventually will reappear in a stream. Since most of our streams sooner or later enter a pond or lake, these fertilizers will be carried there. Fertilizers make aquatic plants grow just as they do the farmer's crops, and this is often very harmful to the ecology of a lake. It causes microscopic plants called algae to multiply so much that fish and other aquatic life cannot eat them fast enough. This is understandable when we realize that every 100 pounds of phosphate fertilizer that finds its way to a lake can cause the production of 1,000,000 pounds of algae! As the plants die and decay, they remove oxygen from the water and the fish die.



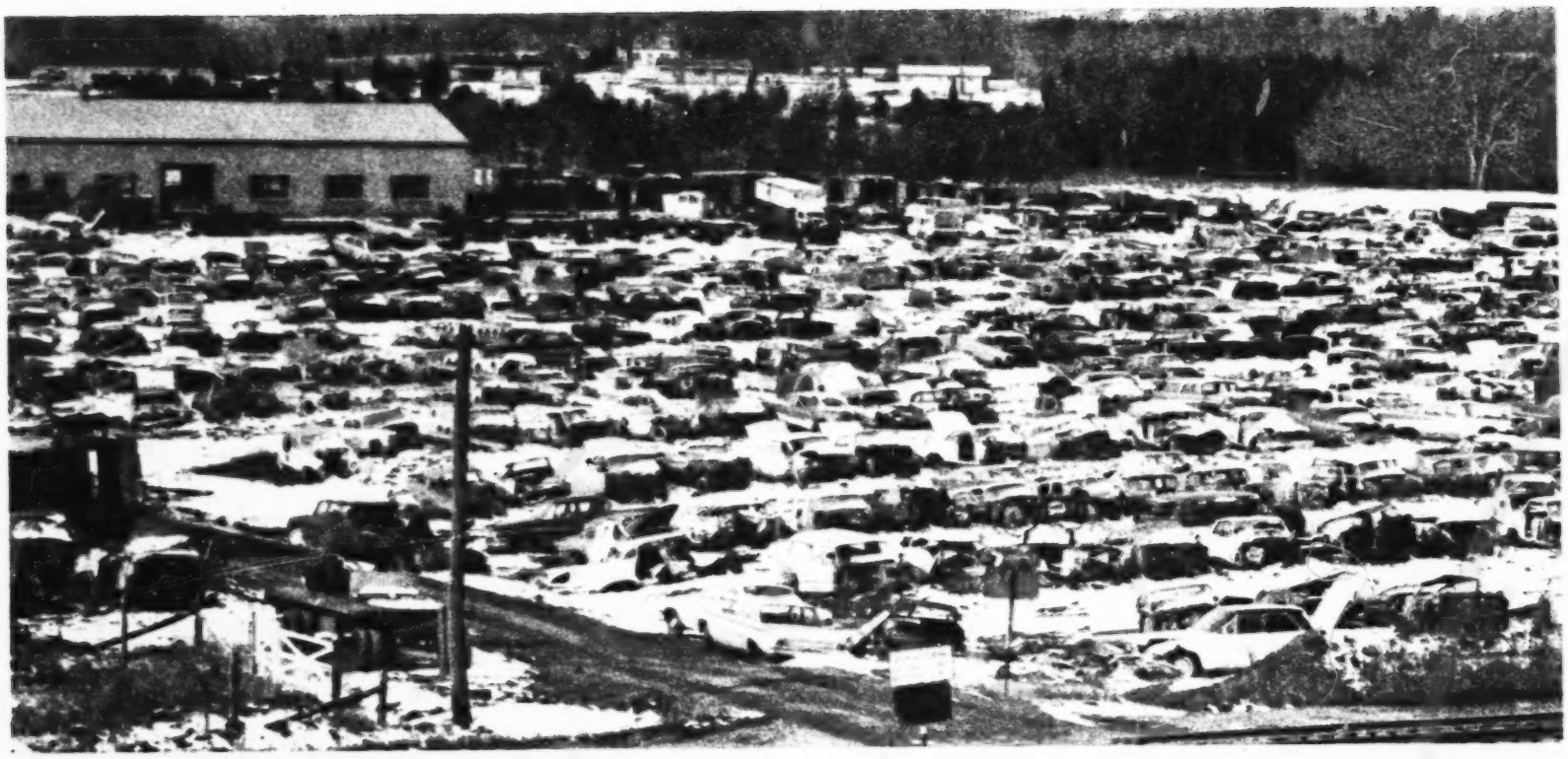
Of all the chemical contaminants now found in New York waters, perhaps the most frightening belong to the group known as pesticides. These are chemicals used to kill unwanted plants or animals. The most notorious of these chemicals is DDT, a poison intended to kill insects. When first used 25 years ago, it was highly effective and was widely hailed as a wonder chemical. Unfortunately, DDT killed all insects — the good as well as the bad. Serious though this indiscriminate killing was, two other very harmful events followed. Insects that survived produced offsprings that became immune. Now, in 1970, it is difficult to kill most insects with DDT. Also, it was discovered that DDT can be concentrated as one animal eats another and that animal, in turn, eats still another. Although the first organism might have had a very tiny amount of DDT in its tissues, the last organism in the chain will have much more. When a bird such as the bald eagle eats a fish that had, in its turn, eaten large numbers of DDT-contaminated aquatic organisms, the eagle can get a lethal dose of the pesticide. Scientists have discovered that the embryos in eagle eggs are extremely high in DDT concentration. In addition, eagle egg shells are now so thin that the mother bird accidentally breaks them while she is trying to incubate. DDT is responsible for the growing scarcity of not only bald eagles, but many other organisms as well. Even human milk contains amounts of DDT exceeding government health standards!

Man's own existence may be threatened by DDT that has found its way into the oceans of the world. The reason is that DDT affects the photosynthesis of algae living in sea water. It is known that approximately 70 percent of the world's oxygen supply is a by-product of photosynthesis by marine algae. The noted ecologist, Joseph J. Hickey, has called DDT the ultimate poison. Many states are enacting legislation controlling the use of DDT, but this action comes too late. DDT is a persistent or " hard " pesticide, meaning that it takes many, many years for it to break down into a harmless substance. In the past 25 years, man has poured tons of this poison on the landscape — in New York State, as well as in other parts of the world. Now the DDT accumulated in the soil may require a generation to disintegrate. Until it is gone, our landscape is poisoned. This is undoubtedly difficult to believe, but the scientists at the Brookhaven National Laboratory provide a sinister proof. They took some mud from an estuary that had been poisoned with DDT 10 years earlier and put it in an enclosure with fiddler crabs. The crabs promptly died.

The Land We Enjoy

As New York and all the other states of our great Nation have continued to grow in population and prosperity, we have sought more and better opportunities to enjoy the outdoors. Following World War II, the resources for outdoor recreation — shoreline, green acres, open space, and unpolluted air and waters — diminished at a rapidly accelerated pace. More leisure time, more and better roads, more automobiles, and more income, all combined to increase the need for outdoor recreation. This became a matter of deep concern for members of Congress, State legislators, and other concerned individuals and organizations. Accordingly, the Congress established an Outdoor Recreation Resources Review Commission. What did the commission find out?

To the surprise of many conservationists, the Commission reported that the simple activities are the most popular. Driving and walking for pleasure, swimming, and picnicking, headed the list of outdoor activities, and driving for pleasure was the most popular of all.



What scenic sights do we behold as we motor along New York's highways? Fields in abundance, beautiful fields — but how many are final resting places for decaying automobile bodies, or surround mushrooming housing developments?. . .Hills and mountains aplenty, with rivers in the valley and lowlands. Clear, cool rivers with lots of sport fishing? And roadsides bright with myriad wild flowers which compete with trash and litter for living space. Auto graveyards, dirty water and dirty air, crowded housing; bottles, cans, and papers everywhere; towering billboards that shout for attention and bear testimony of our affluence. *Must* this be the scenery you behold?

Too Many, Too Soon

The crisis in environmental quality has been brought about by people and what they do, whether through ignorance or selfishness. Early man, heading the biblican injunction to have dominion over all things, committed all sorts of ecological sins. However, the ratio of humans to soil, air, and water resources was so great that the environment could easily recover and purify itself. We may well inquire: Just how many humans *were* there "way back then?" Dr. Roy O. Greep, states in *The Harvard Alumni Bulletin,* that the world population at the beginning of the Christian era "was approximately one quarter billion." Fifteen hundred years later it was still only a half billion; however, from that point, world population began to climb rapidly. It rose to a billion in 1840, 2 billion in 1930, and 3 billion in 1961. We are now working on the 4th billion at the rate of 70,000,000 per year, or a city of 190,000 persons every day, 7 days a week! There is another way to look at these figures, according to Dr. Greep, and that is to observe the *doubling rate.* Starting at the beginning of the Christian era, the first doubling required 1,650 years; the second, 200 years; the third, 90 years; and the one now in the making will not take more than 35 years. If the annual rate of increase continues to climb, the world population will soon be doubling every 23 years.

What is true for the world's population increase is true in many respects for New York State. Urban sprawl — 75 percent of New Yorkers live in cities — is invading and destroying natural resources and natural beauty at an accelerating rate. In the words of the renowned ecologist LaMont Cole, "We humans behave like cancer cells that do not know when to stop multiplying." In the same vein, Dr. Paul R. Erlich has titled his prophetic book: *The Population Bomb.* Persons who question the problems associated with population growth should read this incisive work. Education, "an ecological conscience," as Aldo Leopold put it, and wise use of what we have, will avail us nothing unless we come to grips with this basic, overriding problem in New York and everywhere else on this little spaceship we call Planet Earth.

Education

You and your class can relate to your school and neighborhood environment in meaningful, active ways. Are you satisfied with the physical setting in and around your building? Is there litter that pupils could remove? As a start, why not sponsor a schoolwide antilitter campaign? *Community Organization Guide* (free from KEEP AMERICA BEAUTIFUL, 99 Park Ave., New York, N.Y. 10016) will help you to get started.

Automobile carburetors are not the most pleasant objects to think about, yet they are the primary sources of poisonous air pollutants. Read about this problem in the publication *Another Problem Solved,* available from the New York State Department of Health. Until the modern automobile engine is replaced by an electric or steam turbine mechanism, we can reduce the exhaust problem by keeping our carburetors carefully adjusted at all times. Why not develop a *Carburetor Campaign*? Students could make posters and write short statements calling the problem to everyone's attention. Banks and store windows could display them. Using local news, radio, and T.V. media, you could make an entire area carburetor-conscious.

With your immediate area as a starting point, branch out to other parts of the State. Your State Departments of Conservation, Health, and Commerce will provide attractive, readable publications filled with helpful and impressive information. The State Education Department has a variety of well-written curricula supplements

prepared especially for teachers. Two particularly useful publications are: *Air Pollution and Water Pollution. Educational Leaflet No. 15, Conservation,* offers facts, activity suggestions, and a bibliography. Teachers of any subject matter area find that the *Department's Selected References for Teaching Conservation,* enables them to relate conservation to their particular disciplines. Teachers and pupils who want to study the environment outdoors — where the action is — should consult *Pathways to Better Education, and Science Supplement No. 1: Nature's' Laboratories.*

Helpful Literature

The following is a sampling of the large and growing number of publications which teachers find useful as they work with students in coming grips with the essentials of environmental ecology and man's impact on his surroundings.

Background reading

Commoner, Barry, *Science and Survival.* Viking Press, New York, 1967

Cox, G. W., *Readings in Conservation Ecology.* Appleton-Century-Crofts, New York, 1969

Darling, Louis & Lois Darling, *A Place in the Sun.* Morrow, New York, 1968

Dassmann, Raymond F., *Environmental Conservation.* John Wiley, New York, 1964

Ehrlich, Paul R., *The Population Bomb.* Ballantine Books, New York, 1968

Hirsch, S. Carl, *The Living Community.* Viking Press, New York, 1966

Nash, Roderick, *The American Environment:* Readings in the History of Conservation. Addison-Wesley, Reading, Mass., 1968

Rienow, Robert & Leona T. Rienow, *Moment in the Sun.* Dial Press, New York, 1967

U.S. Department of the Interior, *Conservation Yearbook* series for 1965, 1966, 1967, 1968, 1970. Available from: Superintendent of Documents, Government Printing Office, Washington, D.C. 20402

Conservation classics

Carson, Rachel, *Silent Spring.* Houghton Mifflin, Boston, Mass., 1962

Leopold, Aldo, *A Sand County Almanac.* Oxford University Press, New York, 1949

Osborn, Fairfield, *Our Plundered Planet.* Little, Brown, New York, 1948

Udall, Stewart L., *The Quiet Crisis.* Holt, Rinehart and Winston, New York, 1963

Vogt, William, *The Road to Survival.* William Sloane Associates, New York, 1948

Teaching methods

A Bulletin on Conservation Education, a free periodical available from The Conservation Foundation, 1250 Connecticut Ave. NW., Washington, D.C. 20036

Environmental Education, a journal of research and development in conservation communications. Published at Madison, Wis. by Dunbar Educational Research Services, Inc.

Hammerman, Donald R. & W. M. Hammerman, *Teaching in the Outdoors.* Burgess, Minneapolis, Minn. 1964

Stapp, William B., *Integrating Conservation and Outdoor Education into the Curriculum.* Burgess, Minneapolis, Minn., 1965

The Curious Naturalist, published during the school year by The Massachusetts Audubon Society, Lincoln, Mass. 01773

van der Smissen, Betty & Oswald H. Goering, *A Leader's Guide to Nature-Oriented Activities.* Iowa State University Press, Ames, Iowa, 1965

Watts, May T., *Reading the Landscape.* Macmillan, New York, 1957

Keeping informed

Audubon, official magazine of the National Audubon Society, 1130 Fifth Ave., New York 10028

Conservation Highlights, annual report of the New York State Conservation Department. Available from the department, Albany

National Wildlife, a publication of the National Wildlife Federation, 1214 16th St. NW., Washington, D.C. 20036

The Conservationist, official magazine of the New York State Conservation Department, Albany

Ranger Rick's Nature Magazine, a publication of the National Wildlife Federation, 1214 16th St. NW., Washington, D.C. 20036